|  |  |  |
| --- | --- | --- |
|  |  | הטכניון - מכון טכנולוגי לישראל  TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY |
| הפקולטה להנדסה כימית  ע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Wednesday, September 11th, 2024 at 11:00**

**Zoom:** [**https://gtiit.zoom.us/j/93653803597**](https://gtiit.zoom.us/j/93653803597)

**CO2 hydrogenation to methanol over CuMgAlOx catalysts and Strong metal support interaction (SMSI) between Cu and MgO**

**Yuzhen Chen**

**MSc Seminar**

Advisor: Prof. Ziyi Zhong and Prof. Oz M. Gazit

1. Department of Chemical Engineering, Guangdong Technion-Israel Institute of Technology, China

2. Department of Chemical Engineering, Technion-Israel Institute for Technology, Israel

Global warming is a critical environmental challenge caused by the increase of greenhouse gases in the atmosphere. Governments and researchers worldwide are increasingly recognizing the potential to reuse CO2 to produce valuable chemicals such as olefins, formic acid, methanol, and ethanol. Among these, there is a growing interest in the hydrogenation of CO2 to produce methanol, which is widely used as a platform chemical in the production of olefins and fuel additives.

In the first part, coprecipitation method and solvothermal method are used to synthesize the CuMgAlOx catalysts for CO2 hydrogenation to methanol. The catalysts with different ratios of Cu at low concentrations (< 10%) were prepared and tested for their catalytic performance. XRD, BET, HR-TEM and CO-DRIFT were used for the characterization of samples. The catalysts prepared by solvothermal method have smaller and higher dispersed Cu NPs, thus higher catalytic performance. However, the turnover frequency (TOF) is still relatively low.

In the second part, Cu nanoparticles were immobilized on Mg-Al LDO support (By Solvothermal method). Further calcination in a 15%CO2/85% N2 atmosphere at various temperatures resulted in the formation of Strong metal support interaction (SMSI) between Cu and MgO and oxygen-deficient MgO, confirmed by XRD, CO2-TPD, EPR, HR-TEM and XPS analyses. In situ FTIR studies further revealed that oxygen vacancies favor the formation of monodentate formate species, thus enhancing methanol production.